

TWO NEW SCALE-WORMS  
(POLYNOIDAE: POLYCHAETA) FROM THE LAU  
BACK-ARC AND NORTH FIJI BASINS,  
SOUTH PACIFIC OCEAN

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*Abstract.* — *Thermopolynoe branchiata*, a new genus and species of branchiate polynoid polychaete from the Lau Back-Arc and the North Fiji Basins, South Pacific Ocean, is described. The new species belongs to the subfamily Lepidonotopodinae in having well-developed notopodial bracts. It, however, differs from the other species of the subfamily in having arborescent branchiae. *Thermiphione fijiensis*, a new species of the subfamily Iphioninae from the North Fiji Basin, differs from *T. tufari* by the first occurrence of hooked neurosetae: segment 3 instead of segment 4 of the latter.

The hydrothermal community of the central part of the North Fiji Basin was found by bottom observations using a deep towed camera system during the R/V *Kaiyo* cruise conducted under the French-Japanese project in 1988. A series of cruises named STARMER were realized in the same project in succeeding years by the French submersible *Nautile* and its mother ship R/V *Nadir* (Azuende et al. 1989).

The objective of the second cruise, STARMER II, was the study of biology and ecology of organisms associated with the active vents of the North Fiji Basin. Beds of deep-sea mussels, numerous galatheid crabs, colonies of tiny anemones, and hundreds of gastropods were observed during these surveys (Jollivet et al. 1989). Close to the North-Fiji Basin, other hydrothermal fields occur at the spreading center of the Lau Back-Arc Basin west of the Tonga Islands (Fouquet et al. 1991). A scientific team from France, Germany, and Tonga explored the Lau Basin in 1989 and numerous organisms were collected using *Nautile* and *Nadir* (the NAUTILAU group 1991). Among the animals collected from the above two basins, were numerous specimens of polynoid polychaetes. These collections were provided to

me for study. Nine species were identified and some were found in both basins. In the present study two new species are described. One is thought to belong to the subfamily Lepidonotopodinae and occurs in both basins. Another species from the North-Fiji Basin is attributed to the subfamily Iphioninae. The types are deposited in the Museum National d'Histoire Naturelle à Paris (MNHN), the National Museum of Natural History, Smithsonian Institution (USNM), and Japan Marine Science and Technology Center (JAMSTEC). Some specimens were used for SEM or histological observation at Kagoshima University (KU).

Family Polynoidae  
Subfamily Lepidonotopodinae  
Pettibone, 1983, emended

The subfamily is emended to include *Thermopolynoe branchiata*, new species. There may be parapodial arborescent branchiae instead of lacking branchiae.

*Thermopolynoe*, new genus

*Type species.* — *Thermopolynoe branchiata*, new species.

*Gender.* — Feminine.

*Diagnosis.*—Body flattened; 27 segments (first achaetous). Elytra 11 pairs, on large elytophores on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, and 21. Dorsal cirri on non-elytrigerous segments; dorsal tubercles large. Branchiae well developed, arborescent. Prostomium bilobed; anterior lobes cylindrical, with frontal filaments; median antenna with short ceratophore and subulate style, inserted in anterior notch; palps with slender tips. First or tentacular segment not distinct dorsally; tentaculophores achaetous lateral to prostomium with two pairs of tentacular cirri. Segment 2 with first pair of elytophores, biramous parapodia, and buccal cirri. Parapodia biramous, with notopodia shorter than neuropodia. Notopodia subconical, with large bracts. Neuropodia truncate, with fimbriated margins. Notosetae and neurosetae numerous, spinous. With or without ventral segmental papillae on middle segments. Pygidium bulbous, wedged between posterior parapodia, with pair of anal cirri. Pharynx with seven pairs of papillae and two pairs of jaws.

*Etymology.*—The generic name is from Greek, *Thermos*, hot and *Polynoe*, genus name of a polynoid worm.

*Thermopolynoe branchiata*, new species

Figs. 1–4

*Material examined.*—White Lady, North Fiji Basin, DSRV *Nautila* Dive 16, 11 Jul 1989, STARMER II Station 4, 16°59.5'S, 173°55.5'E, 2000 m, Holotype (MNHN UD 264), 14 paratypes (MNHN UD 262, JAM-STEAC, KU). Same site, Dive 13, 8 Jul 1989, paratype (MNHN UD 265). Same site, Dive 20, 15 Jul 1989, 4 paratypes (USNM 168325). Vailili, Lau Basin, DSRV *Nautila* Dive 10, 22 May 1989, BIOLAU Station 2, 23°13'S, 176°38'E, 1750 m, 2 paratypes (MNHN UD 261).

*Description.*—Holotype 36 mm long, 12 mm wide including parapodia, with 27 segments including first achaetous tentacular segment. Largest paratype 53 mm long, 20

mm wide, with 27 segments. Body sturdy, slightly tapered anteriorly and posteriorly, flattened ventrally, slightly arched dorsally (Fig. 1a, b). Integument smooth. Preserved specimens brownish to tan.

Elytra 11 pairs, on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, and 21, large, covering dorsum, oval, stiff, rough with numerous brownish papillae on white bases (Figs. 1a, 2d–g). Elytra on segments 2–19 oval, wider than long (Fig. 2d, f); last pair on segment 21 subreniform, longer than wide (Fig. 2e). Dorsal cirri on non-elytrigerous segments with short cylindrical cirrophores, and short styles with slender tips, extending to tips of neurosetae; dorsal tubercles nodular (Figs. 3c, f, 4a–c). Branchiae arborescent, present on segments 3–26, around bases of dorsal tubercles and elytophores; separated into two groups on anterior and posterior sides of notopodia on segments 3 and on some less-developed posterior segments; forming single large branchial areas encircling central parts of notopodia on other fully developed parapodia with about 20 tufts of branchiae; each tuft with 1–15 filaments; each parapodium maximally with about 80 branchial filaments (Figs. 3f–g, 4a, b).

Prostomium bilobed. Anterior lobes prominent, cylindrical, extending anteriorly, with small frontal filaments; median antenna, inserted in anterior notch, with short cylindrical ceratophore and subulate style extending to about tip of palp; palps thick, slightly wrinkled, extending beyond prostomium, with slender tips. Tentacular segment not distinct dorsally; tentaculophores lateral to prostomium achaetous, with two pairs of tentacular cirri slightly shorter than palps (Fig. 3a, b).

Segment 2 with first pair of elytophores and biramous parapodia; ventral or buccal cirri attached basally on prominent cirrophores lateral to mouth, with styles similar to tentacular cirri, longer than following ventral cirri (Fig. 3a, b, e). Mouth opening situated between segments 1 and 2. Muscular pharynx encircled by seven pairs of

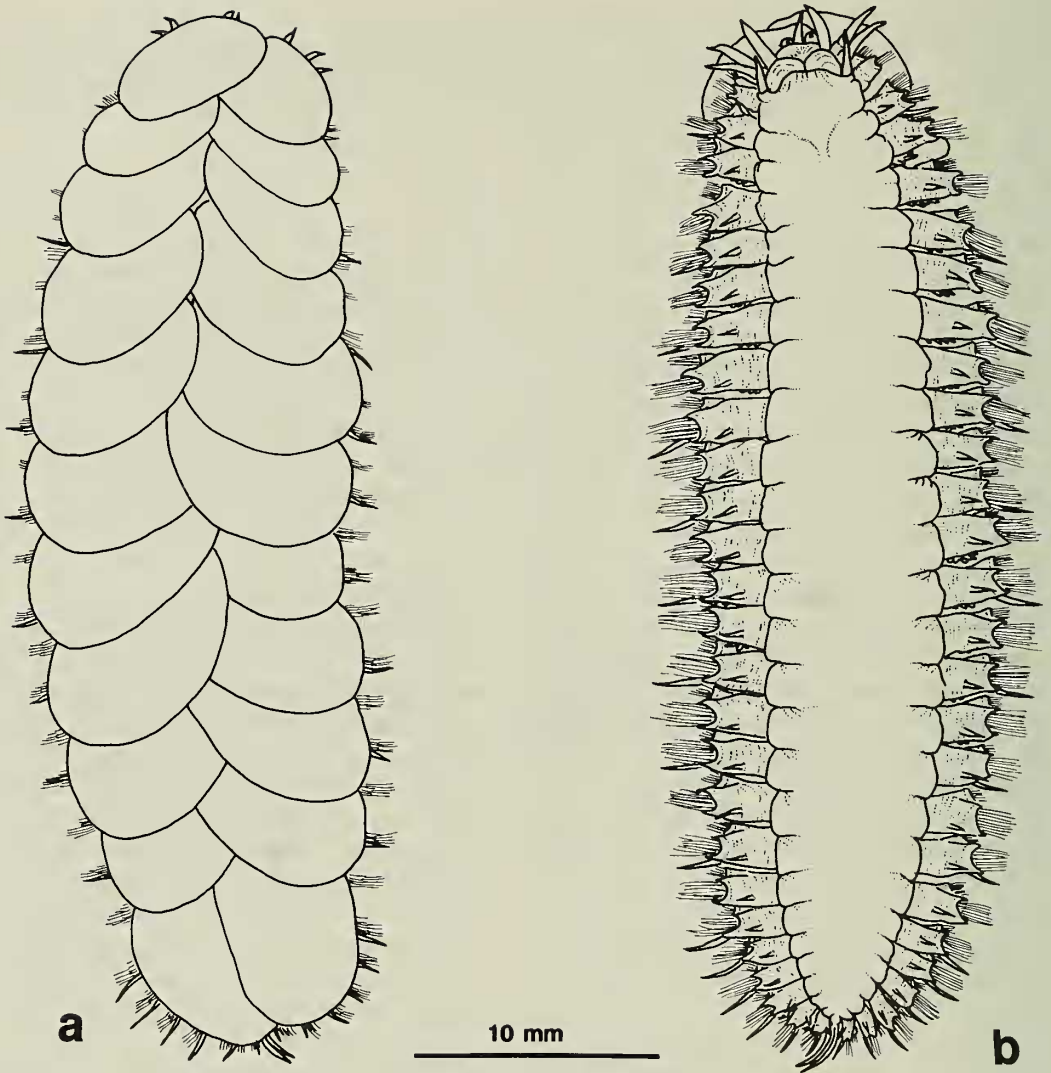


Fig. 1. *Thermopolynoe branchiata*, new species. Paratype (MNHN UD 265): a, Dorsal view; b, Ventral view.

bulbous papillae, subequal in size; dorsal and ventral pairs of jaws fused medially, each with 5–7 teeth on basal sides (observation on dissected paratypes).

Segment 3 with first pair of arborescent branchiae, dorsal cirri, short ventral cirri, and setal lobes similar to segment 2 (Fig. 3a, b, f). Following parapodia biramous, with short notopodia on anterodorsal sides of large neuropodia (Fig. 3g). Notopodia subconical, with projecting acicular lobes hid-

den by numerous notosetae, and enclosed antero-dorsally by well-developed large flaring bracts (Figs. 3e–g, 4a–c). Neuropodia diagonally truncate, deeply notched on upper part; distal margins fimbriated with slender filaments covered with numerous filamentous bacteria (Fig. 2a–c).

Notosetae numerous, forming radiating bundles, much stouter than neurosetae, serrated on distal margins; tips bare, blunt, tapered (Fig. 4d). Neurosetae numerous,

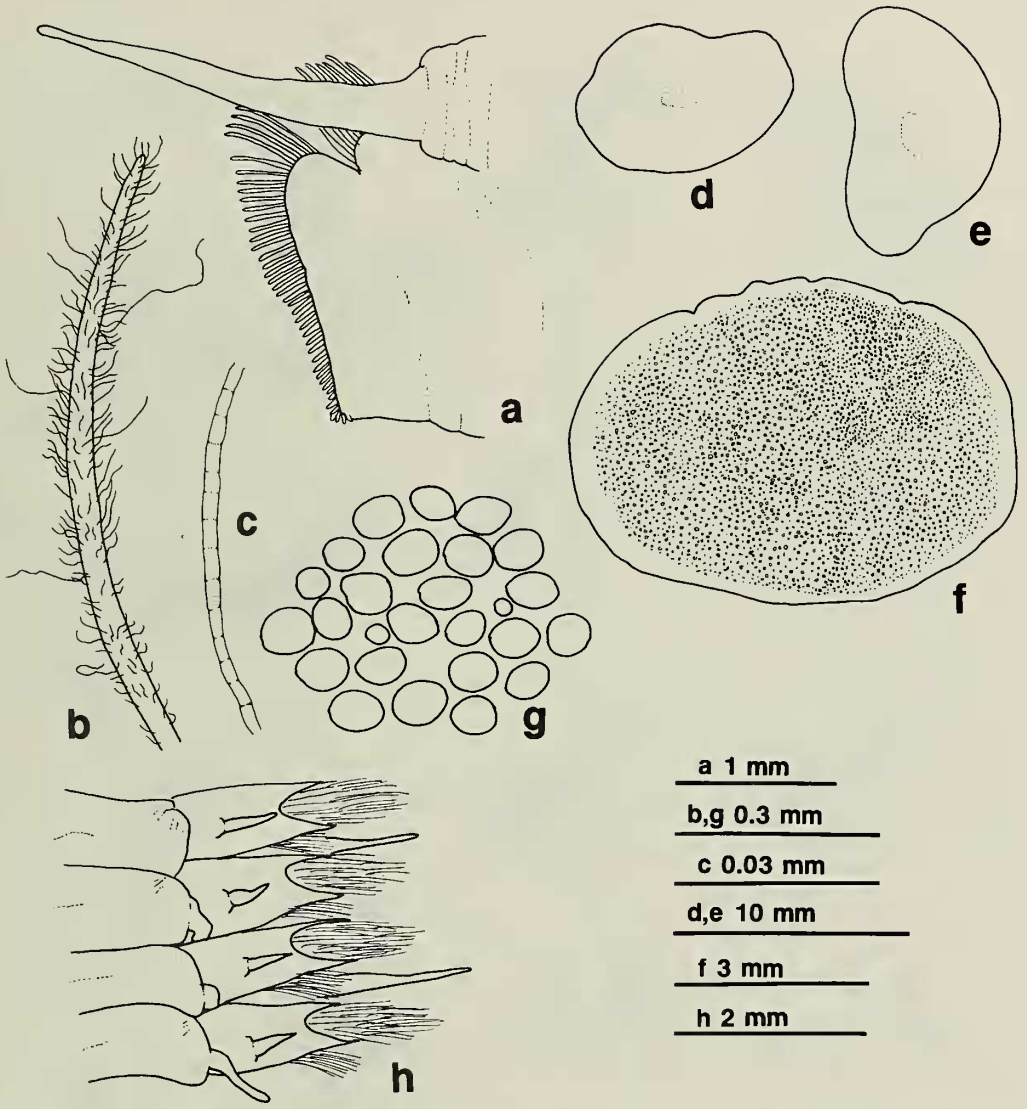


Fig. 2. *Thermopolynoe branchiata*, new species. Paratype (MNHN UD 265): a, Left cirriferous parapodium from segment 10, anterior view; b, Filament of neuropodium from same, with filamentous bacteria; c, Bacterial filament; d, Left (5th) elytron from segment 9, papillae eliminated; e, Left (11th) elytron from segment 21, papillae eliminated; f, Left (1st) elytron from segment 2, surface micropapillae illustrated; g, Papillae from same; Paratype (MNHN UD 262): h, Left halves of segments 10–13, ventral view.

forming fan-shaped bundles. Supraacicular neurosetae with numerous prominent spines in two rows; tips bare, tapered (Fig. 4e). Subacicular neurosetae with numerous prominent spines in single rows; tips bare, slightly hooked (Fig. 4f).

Ventral segmental papillae long, attached

to bases of neuropodia, and extending to bases of ventral cirri; three pairs present on segments 12, 13, and 14 (Fig. 2h), or lacking in half of large specimens (Fig. 1b). Pygidium visible dorsally as bulbous lobe, wedged between parapodia of posterior smaller segments (26–27), with pair of long ventral anal

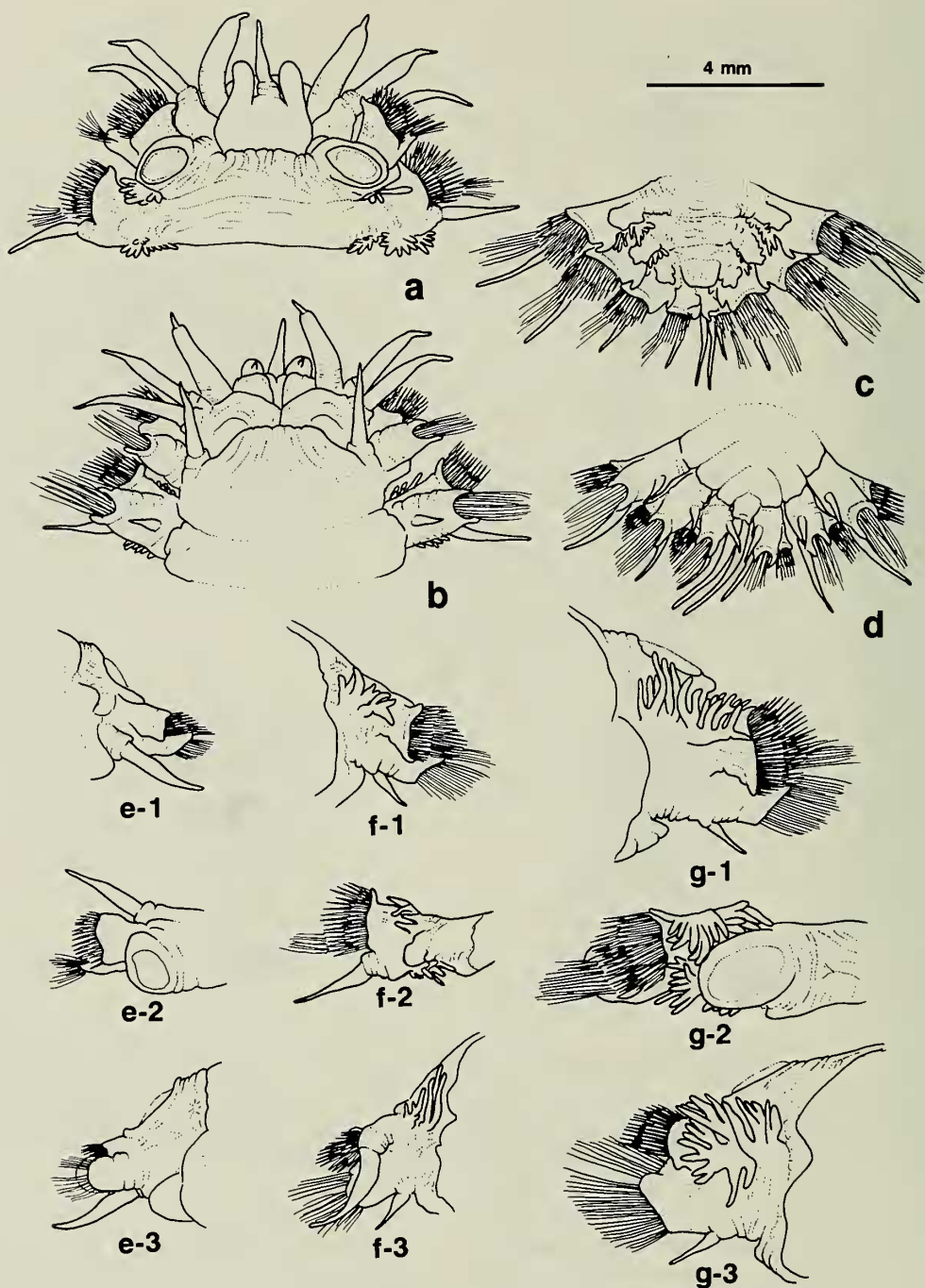


Fig. 3. *Thermopolynoe branchiata*, new species. Paratype (MNHN UD 265): a, Anterior end, dorsal view; b, Same, ventral view; c, Posterior end, dorsal view; d, Same, ventral view; e-1, Left clytrigerous parapodium from segment 2, elytron removed, anterior view; e-2, Same, dorsal view; e-3, Same, posterior view; f-1, Left clytrigerous parapodium from segment 3, anterior view; f-2, Same, dorsal view; f-3, Same, posterior view; g-1, Left clytrigerous parapodium from segment 9, elytron removed, anterior view; g-2, Same, dorsal view; g-3, Same, posterior view.

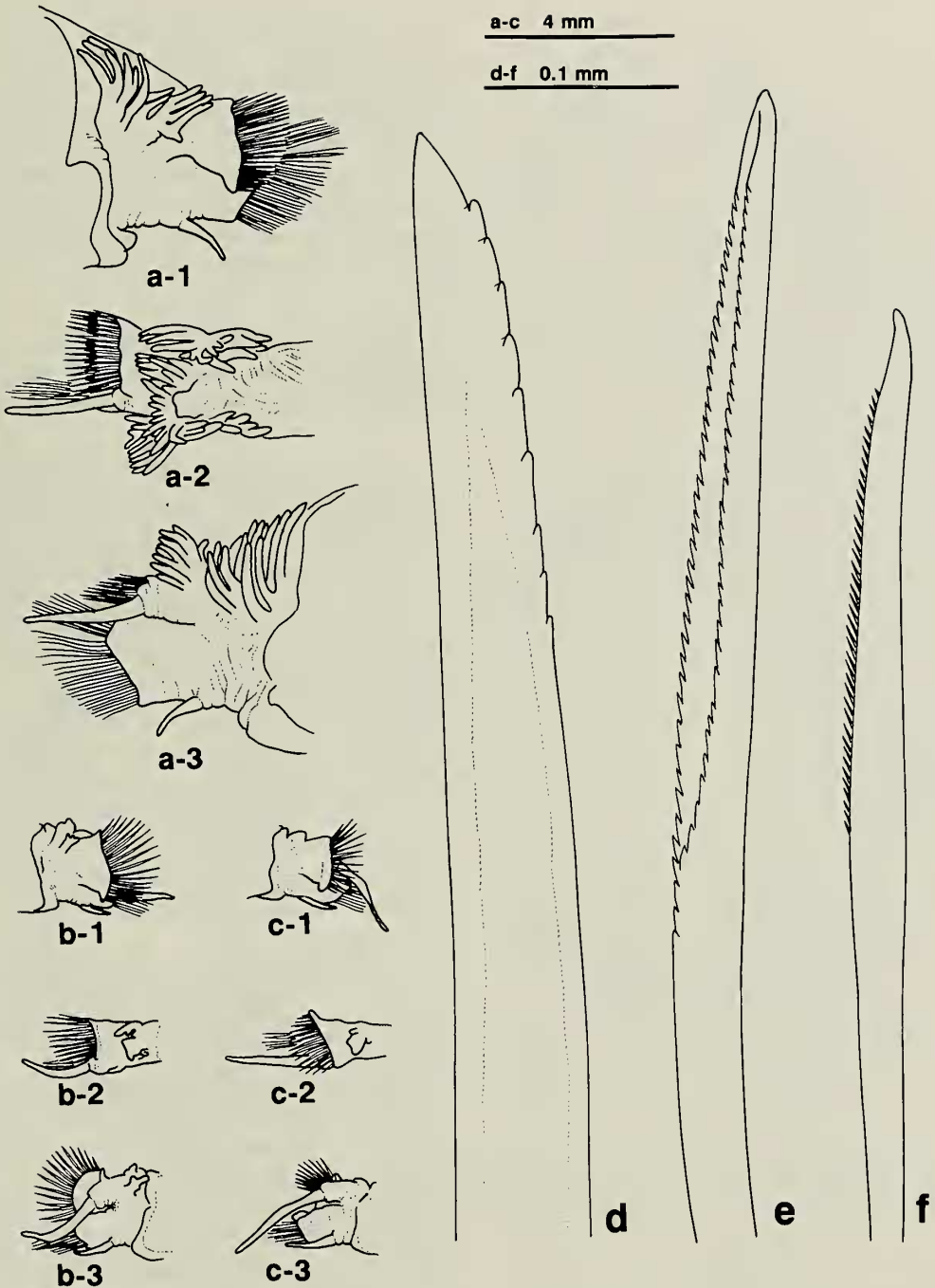


Fig. 4. *Thermopolynoe branchiata*, new species. Paratype (MNHN UD 265): a-1, Left cirriferous parapodium from segment 10, anterior view; a-2, Same, dorsal view; a-3, Same, posterior view; b-1, Left cirriferous parapodium from segment 26, anterior view; b-2, Same, dorsal view; b-3, Same, posterior view; c-1, Left cirriferous parapodium from segment 27, anterior view; c-2, Same, dorsal view; c-3, Same, posterior view; d, Notoseta from segment 9; e, Supraacicular neuroseta from same; f, Subacicular neuroseta from same.

cirri, similar to posterior dorsal cirri (Fig. 3c, d).

*Variation in paratypes.*—Among the paratypes, two small (young) specimens had less than 27 segments. They were 8.1 and 13 mm long by 4.4 and 6.1 mm wide with 24 and 25 segments, respectively. The specimens with 27 segments varied from 12 mm to 53 mm in length and from 6.5 to 20 mm in width. Of the 22 specimens examined, 12 had three pairs of elongate ventral papillae on segments 12–14, a single specimen had two pairs on segments 12–13, and nine lacked ventral papillae.

*Etymology.*—The name was derived from the arborescent branchiae of the species.

*Remarks.*—The structure of prostomium, tentacular segment, and pharynx of the new species recalls the subfamilies Macellicephalinae and Lepidonotopodinae (Pettibone 1976, 1983, 1984b, 1985b, 1988, 1989, 1990). Of the genera of these two subfamilies, *Thermopolynoe* is the closest to *Lepidonotopodium* in having well-developed notopodial bracts, 11 pairs of elytra, long segmental papillae, seven pairs of pharyngeal papillae, and fimbriated neuropodia. However, *Thermopolynoe branchiata* clearly differs from the species of *Lepidonotopodium* in having well-developed arborescent branchiae instead of lacking them.

In the family Polynoidae, the species of three subfamilies, Branchipolynoinae, Branchinotogluminae and Branchiplicatinae, have well-developed branchiae. The first two families have arborescent type of branchiae and the Branchiplicatinae, folded type (Pettibone 1985a). *Peinaleopolynoe sillardii* Desbruyères & Laubier, whose affiliation on the subfamily was not assigned by the authors, also has arborescent branchiae (Desbruyères & Laubier 1988). The species was recently examined and referred to the Branchinotogluminae by Pettibone (1993), along with a new species of *Peinaleopolynoe*: *P. santacatalina*. The presence of these well-developed arborescent branchiae is an unusual feature in the family Polynoidae as mentioned by Pettibone (1984a). *Thermo-*

*polynoe branchiata* is, however, unique among these branchiate polynoids in having well-developed bracts encircling the notopodia. The new species differs from them also in the position of branchiae: branchiae are separated in anterior and posterior groups or forming single continued branchial areas in *T. branchiata*, but divided in upper and lower groups in others.

Subfamily Iphioninae Baird, 1865

*Thermiphione* Hartmann-Schröder, 1992

*Thermiphione fijiensis*, new species

Figs. 5–7

*Material.*—White Lady, North Fiji Basin, DSRV *Nautile* Dive 16, 11 Jul 1989, STARMER II Station 4, 16°59.5'S, 173°55.5'W, 2000 m, Holotype (MNHN UD 266) & 8 paratypes (USNM 168326, MNHN UD 263, KU); Dive 20, 15 Jul 1989, 1 paratype (JAMSTEC); Dive 21, 16 Jul 1989, 1 paratype (JAMSTEC).

*Description.*—Holotype 14 mm long, 7 mm wide including setae, with 31 segments including first setigerous tentacular segment. Largest paratype 20 mm long, 10 mm wide, with 30 segments. Body short, ovate, flattened ventrally and slightly arched dorsally (Fig. 5a, b). Pygidium without appendages (Fig. 5e).

Elytra 14 pairs, large, strongly imbricated, light yellow, stiff, rough with numerous papillae (Figs. 5a, 6a–e), present on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, and 27. Elytra on segment 2 oval, with fringes of short papillae, covered with filamentous bacteria (Fig. 6a, g, h). Other elytra elongate subreniform, narrower medially, wider laterally; lateral borders with fringes of short papillae (Fig. 6b–e). Elytral surfaces covered with hexagonal or polygonal areas with secondary areolae (Fig. 6f). Elytrophores bulbous, transversely elongated; places of attachment with latero-posterior extensions (Fig. 5c, e). Dorsal tubercles on cirriferous segments bulbous, prominent, transversely elongated, continuous with enlarged cirrophores of dorsal cirri

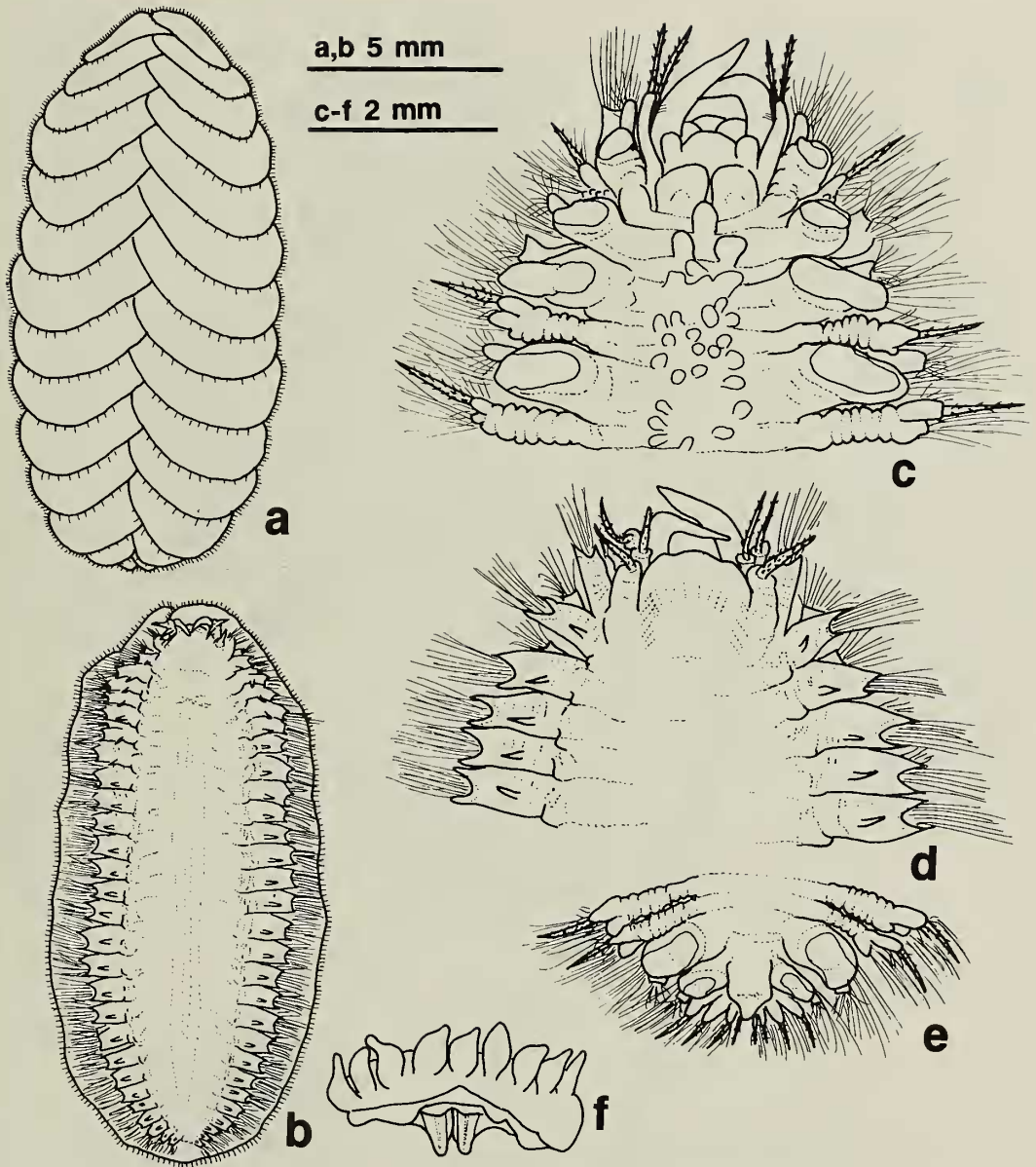


Fig. 5. *Thermiphione fijiensis*, new species. Holotype (MNHN UD 266): a, Dorsal view; b, Ventral view; c, Anterior end, dorsal view; d, Same, ventral view; e, Posterior end, dorsal view; Paratype (JAMSTEC): f, Distal end of pharynx showing jaws and border papillae.

(Figs. 5c, 7e). Dorsal cirri on non-elytrigerous segments with long cylindrical cirrophores and short styles, extending to tips of neurosetae (Figs. 5c, 7c, e). Dorsal and ventral cirri with short clavate papillae (Fig. 7f).

Prostomium partially fused to tentacular segment, and withdrawn in anterior seg-

ments (Fig. 5c, d). Prostomium bilobed, forming separate rounded lobes, with anterolateral extensions; without antennae; palps thick, smooth, ventral to lateral prostomial extensions (Fig. 5c). Tentacular segment with long cylindrical tentaculophores lateral to prostomium; each with single aci-



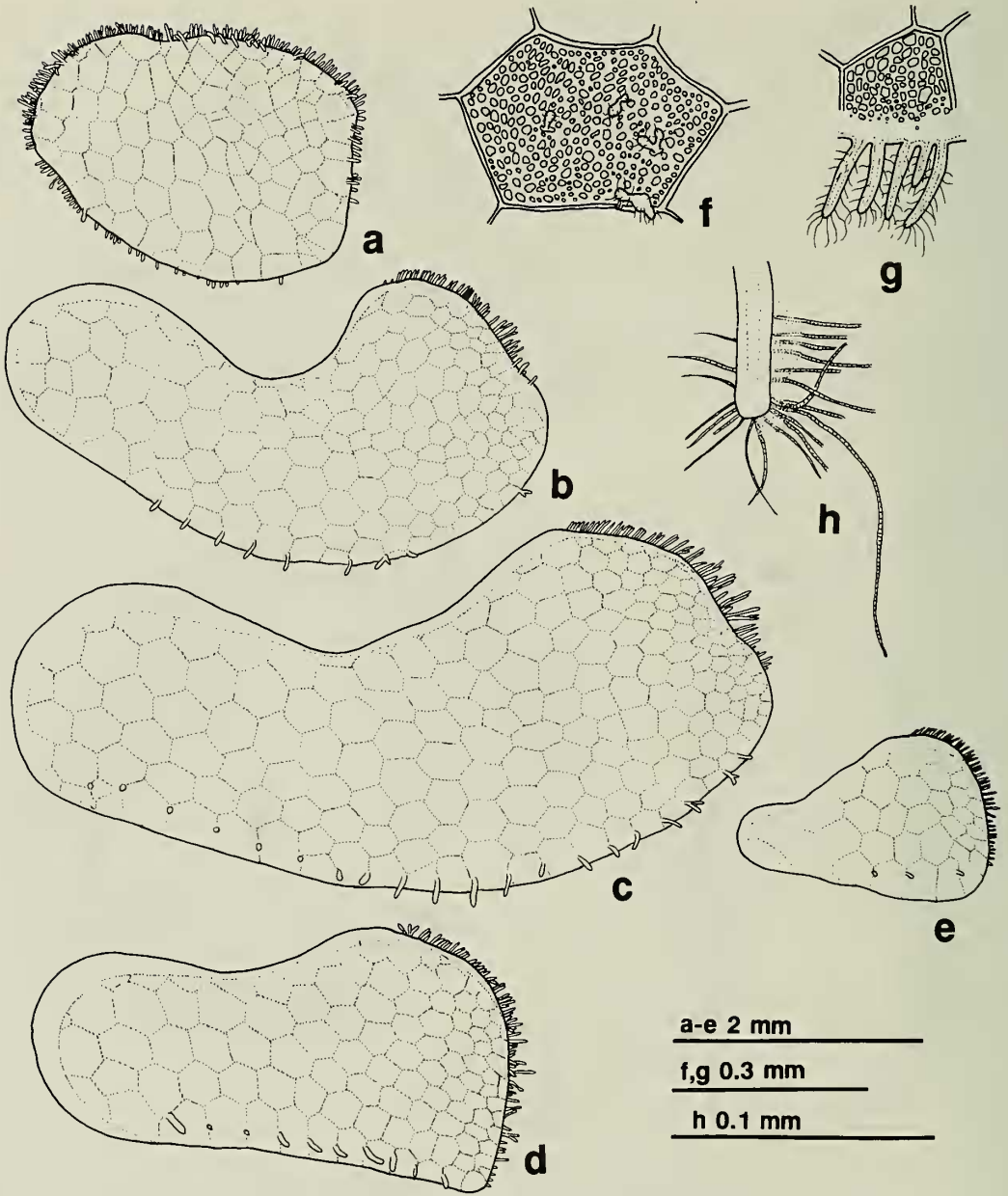


Fig. 6. *Thermiphione fijiensis*, new species. Holotype (MNHN UD 266): a, Right first elytron from segment 2; b, Right elytron from segment 5; c, Right elytron from segment 17; d, Right elytron from segment 26; e, Right elytron from segment 27; f, Enlarged hexagonal area enclosing small areolae of right elytron from segment 2; g, Enlarged margin of right elytron from same; h, Enlarged marginal papilla of same, with filamentous bacteria.

culum, few capillary setae, and dorsal and ventral tentacular cirri, shorter than palps (Figs. 5c, d, 7a, g). Nodular papillae arising from dorsum of anterior segments; more

than 20 papillae on anterior 7 segment; arranged in two or more rows before segment 14, thereafter in single row, absent posterior to segment 20 (Fig. 5c).

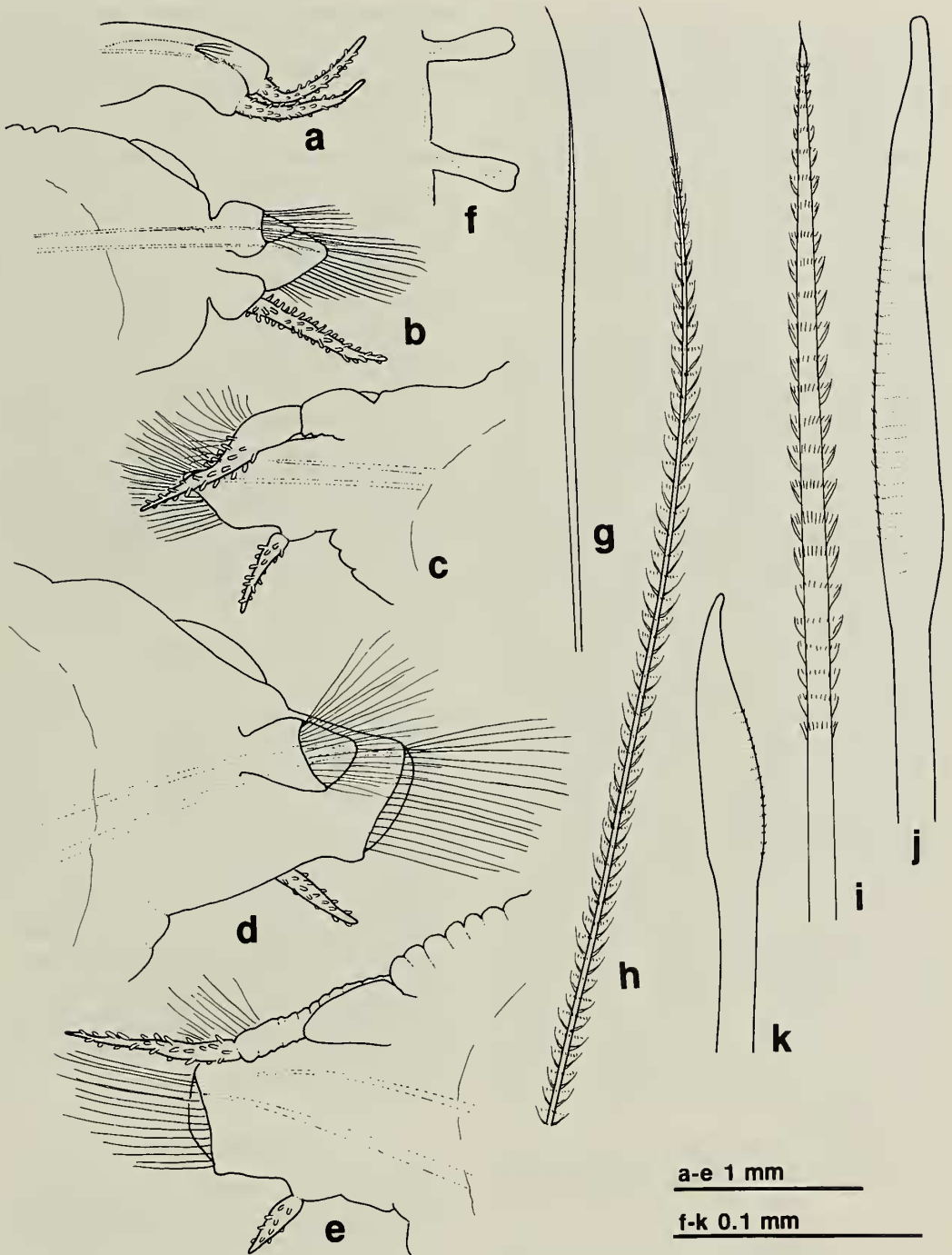


Fig. 7. *Thermiphione fijiensis*, new species. Holotype (MNHN UD 266): a, Left tentaculophore, inner ventral view, single aciculum dotted; b, Left elytrigerous parapodium from segment 2, anterior view, noto- and neuroaciculum dotted; c, Left cirriferous parapodium from segment 3, posterior view; d, Left elytrigerous parapodium from segment 13, anterior view; e, Left cirriferous parapodium from segment 14, posterior view; f, Enlarged papillae on ventral buccal cirrus of segment 2; g, Capillary seta from tentaculophore; h, Notoseta; i, Upper feathered neuroseta; j, Middle slightly hooked neuroseta; k, Lower hooked neuroseta.

Segment 2 with single rounded nuchal lobe, elongated elytophores, first pair of elytra, biramous parapodia, and ventral buccal cirri attached basally on prominent cirrophores lateral to mouth, with styles similar to tentacular cirri, longer than following ventral cirri (Figs. 5c, d, 7b). Muscular pharynx encircled by nine pairs of bulbous papillae subequal in size; dorsal and ventral pairs of jaws fused medially, without teeth (Fig. 5f).

Segment 3 not visible dorsally, with dorsal cirri, and parapodia wedged between elytophores of segments 2 and 4 (Figs. 5c, 7c). Biramous parapodia with short notopodia on anterodorsal sides of large truncate neuropodia (Fig. 7d, e). Notopodia subconical, with projecting acicular lobes hidden by numerous notosetae (Fig. 7d). Notosetae forming radiating bundles of dense tufts, shorter than neurosetae, feathered, with slender axes and long capillary tips (Fig. 7h). Upper neurosetae feathered, stouter than notoseta, with short capillary tips (Fig. 7i); middle neurosetae stout, hooked, with long, faint spinous areas (Fig. 7j); lower neurosetae similar but shorter, hooked, with short, faint spinous areas (Fig. 7k). Hooked neurosetae first present on segment 3.

*Variation in paratypes.*—Among the type specimens, three small (young) specimens had less than 30 segments, with 10–12 pairs of elytra. The other specimens had 30 segments and 14 pairs of elytra, except for the holotype with 31 segments. These larger specimens varied from 10.0 to 19.6 mm in length and from 5.5 to 10.0 mm in width. In all specimens, hooked neurosetae started from segment 3.

*Etymology.*—The species name is derived from the type locality, the North Fiji Basin.

*Remarks.*—The presence of only a remnant or the complete absence of a median prostomial antenna is characteristic for the subfamily Iphioninae. The Iphioninae differ from other polynoids also by the unique reticulated elytra with hexagonal or poly-

gonal honey-comb-like areas, the tentaculophore of the first segment with a few capillary setae, and styles of the dorsal and ventral parapodial cirri. In four previously known genera of the subfamily, *Iphionides* differs from others in having secondary lattice structure in each polygonal area of elytron, small dorsal tubercles, up to 39 segments, and up to 20 pairs of elytra (Pettibone 1986). Both *Iphione* and *Iphionella* have 29 segments and 13 pairs of elytra. *Thermiphione* differs from the above three genera in having 30–31 segments and 14 pairs of elytra. The last two elytra occur on segments 23 and 27 in *Iphione*, on 23 and 26 in *Iphionella*, and on segments 26 and 27 in *Thermiphione*. *Thermiphione fijiensis* differs from the other congeneric species *T. tungari* by the first occurrence of hooked neurosetae: segment 3 instead of segment 4 of the latter (Hartmann-Schröder, 1992).

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